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Patel et al.

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(54) **TEXT INPUT ON TOUCH SENSITIVE INTERFACE**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 315 days.

This patent is subject to a terminal disclaimer.

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G03H 1/00 (2006.01)

(52) **U.S. Cl.**
CPC ... **G09G 5/00** (2013.01); **G03H 1/00** (2013.01)

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CPC G06F 1/163; G06F 3/013; G02B 27/017;
G09G 5/00; G03H 1/00
USPC 345/7-9, 173-174; 359/13
See application file for complete search history.

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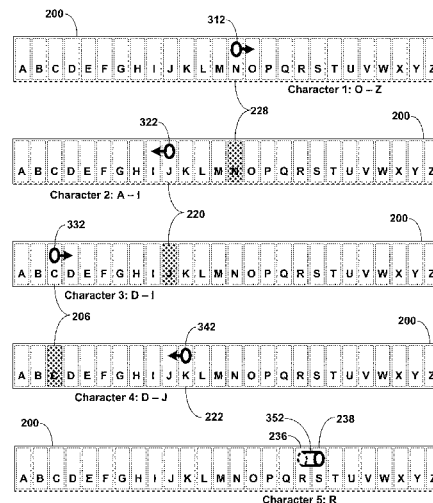
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(57) **ABSTRACT**

Methods and systems for text input are provided. In one example, a head-mountable device (HMD) having a touch interface may be configured to receive touch inputs from a user to enter text. The touch interface may include input areas corresponding to characters. The HMD may be configured to determine characters and words the user wishes to enter according to different touch inputs, including land inputs, lift inputs, flick inputs, drag inputs, tap inputs, and scratch inputs. In one case, the HMD may determine subsets of characters for each letter in a word the user wishes to enter, and determine the word the user wishes to enter according to the subsets of characters. In another case, the HMD may determine a vector array corresponding to the word the user wishes to enter, and determine the word the user wishes to enter by comparing the vector array against word vector templates.

20 Claims, 10 Drawing Sheets



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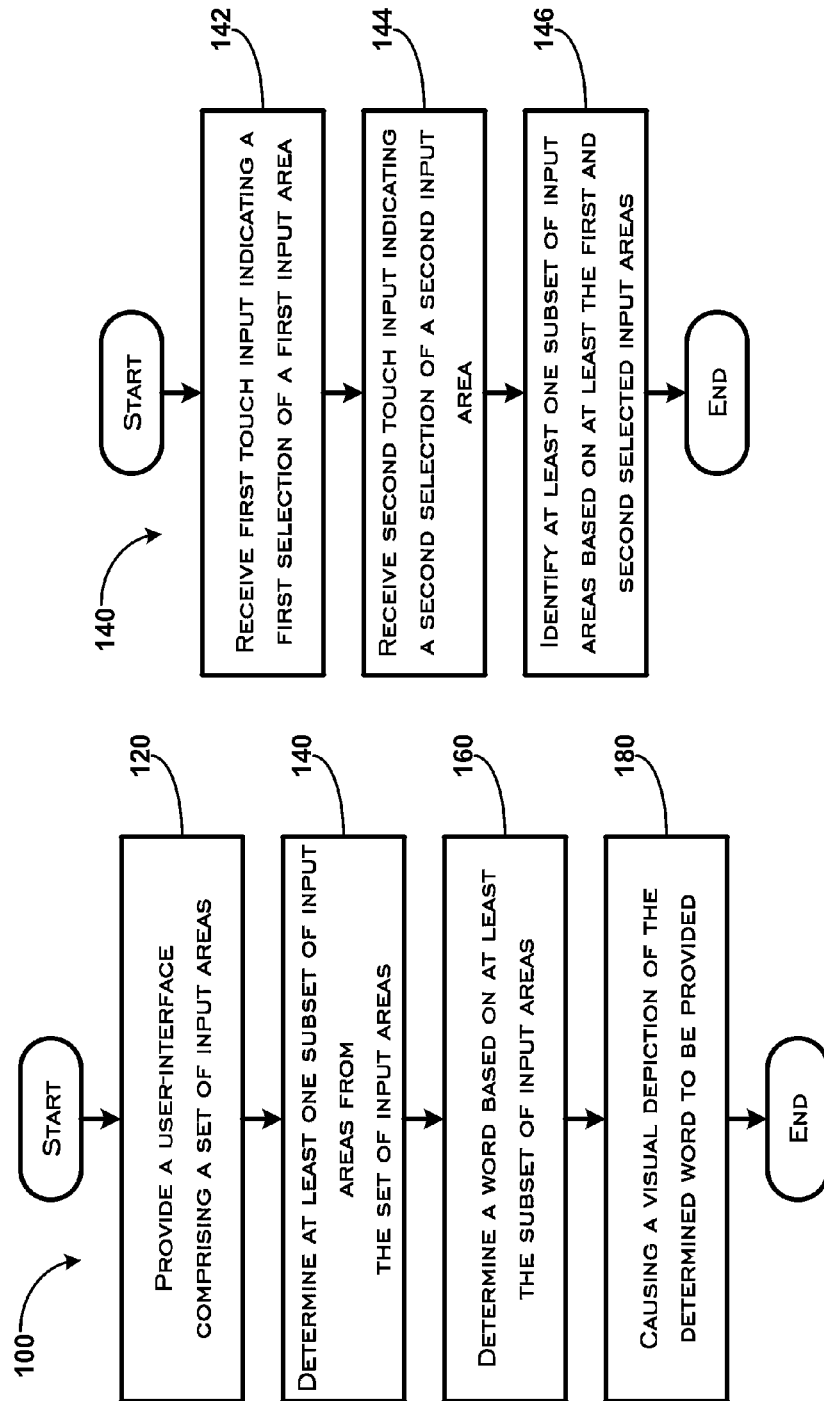


FIGURE 1A

FIGURE 1B

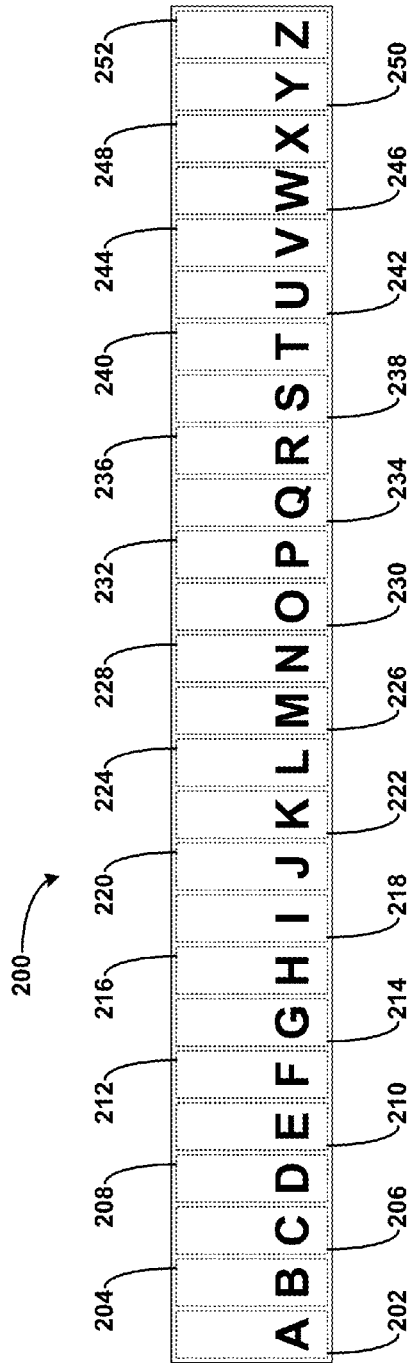


FIGURE 2A

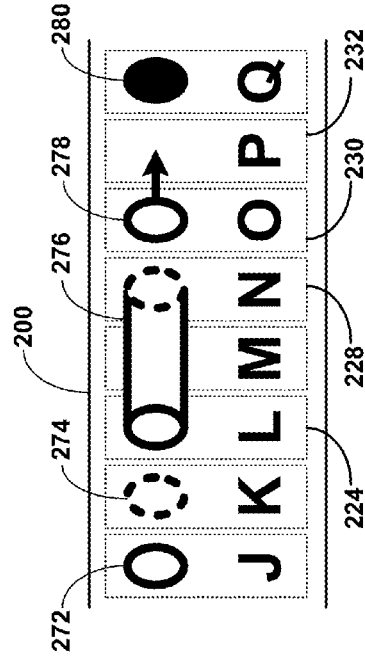
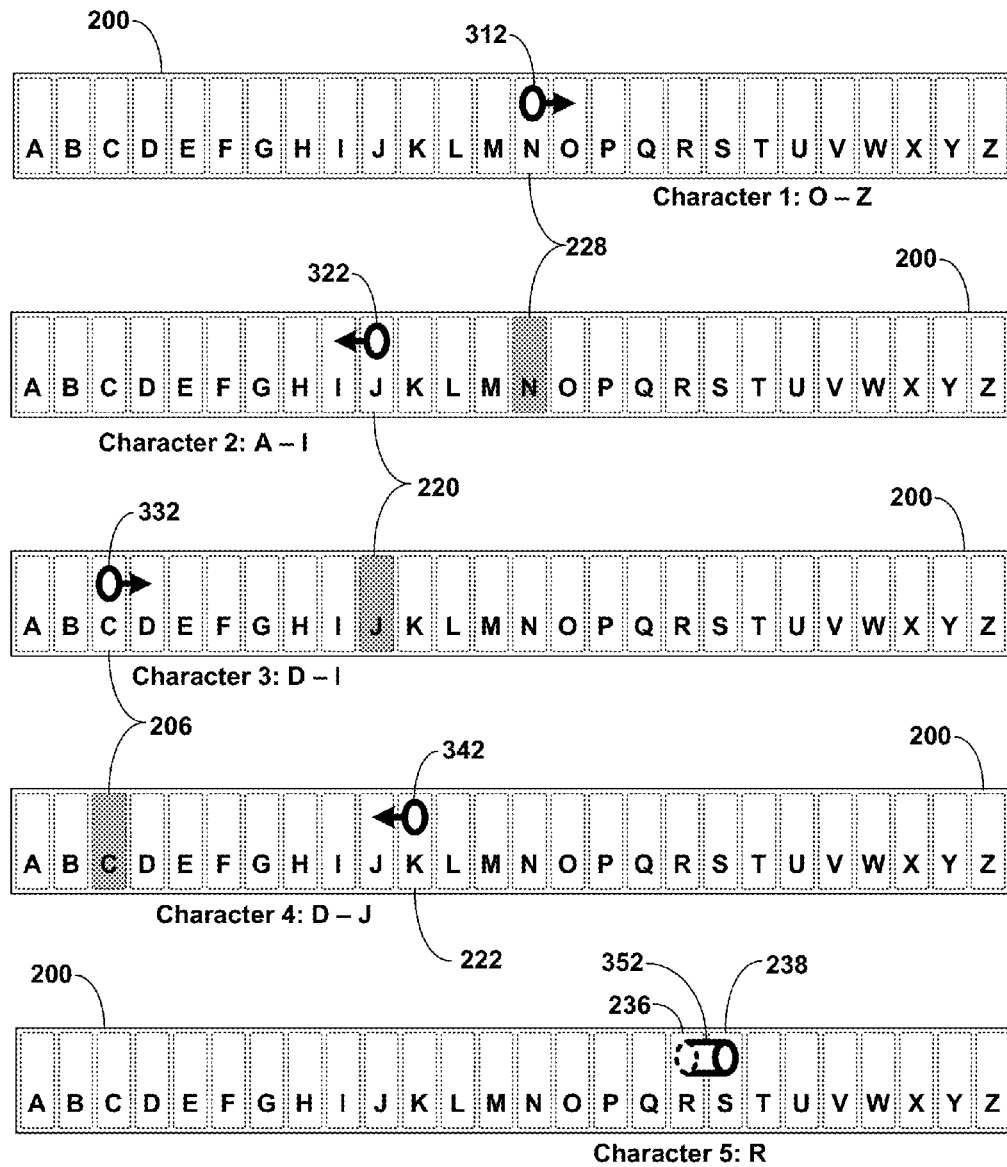
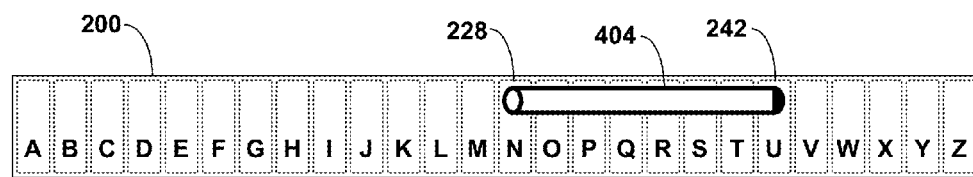
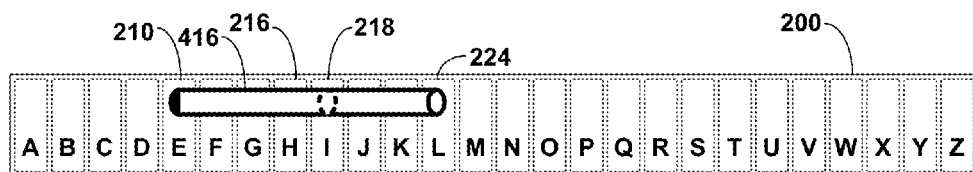


FIGURE 2B

**FIGURE 3**



Character 1: O ~ U



Character 2: F ~ I

FIGURE 4

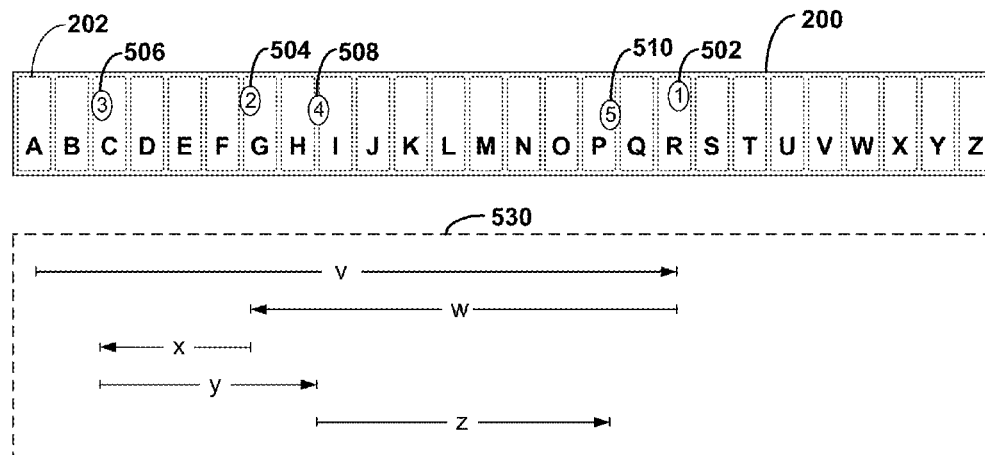


FIGURE 5A

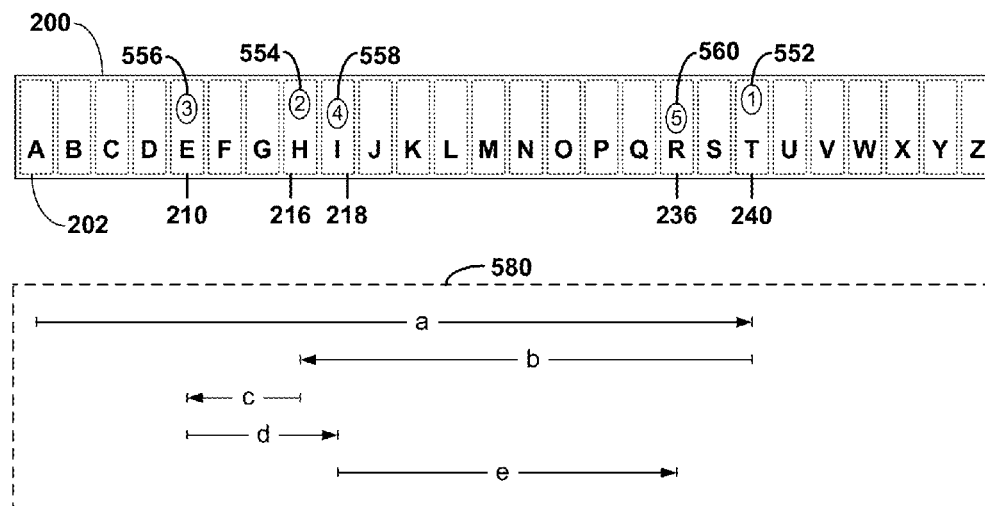


FIGURE 5B

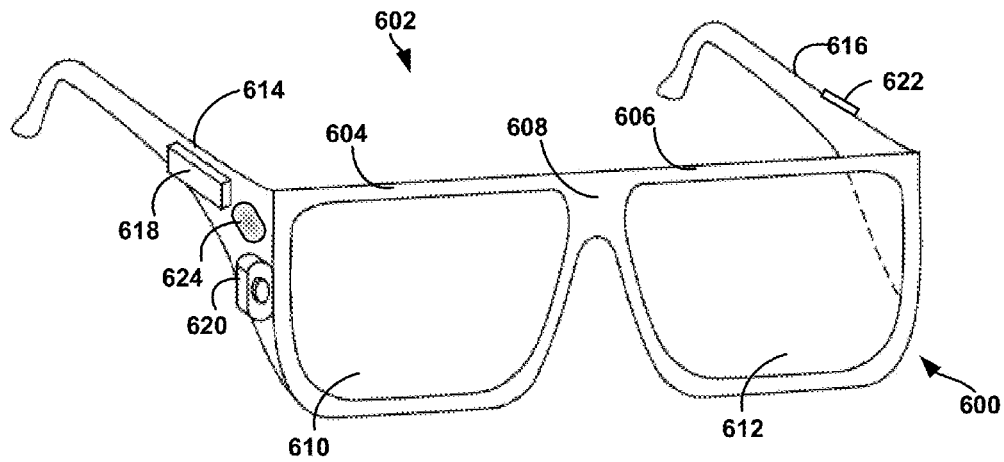


FIGURE 6A

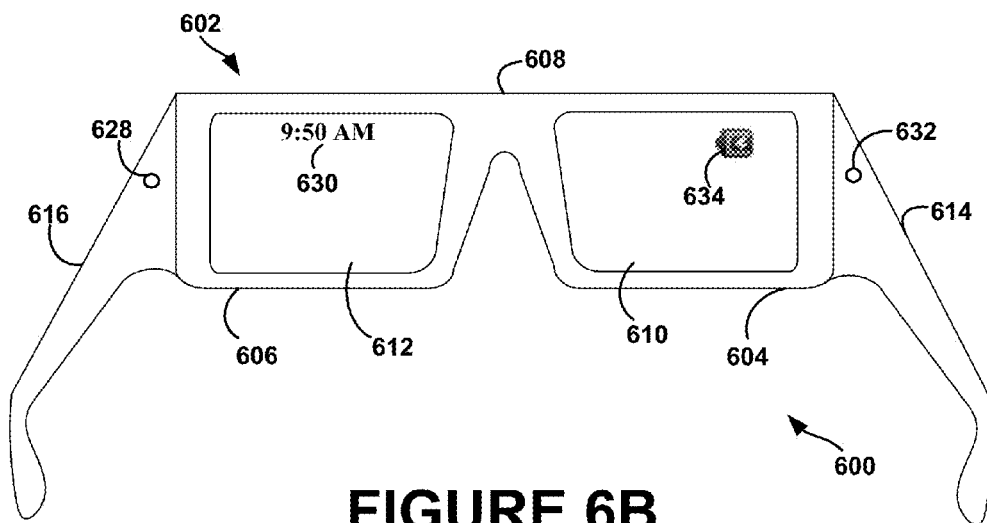


FIGURE 6B

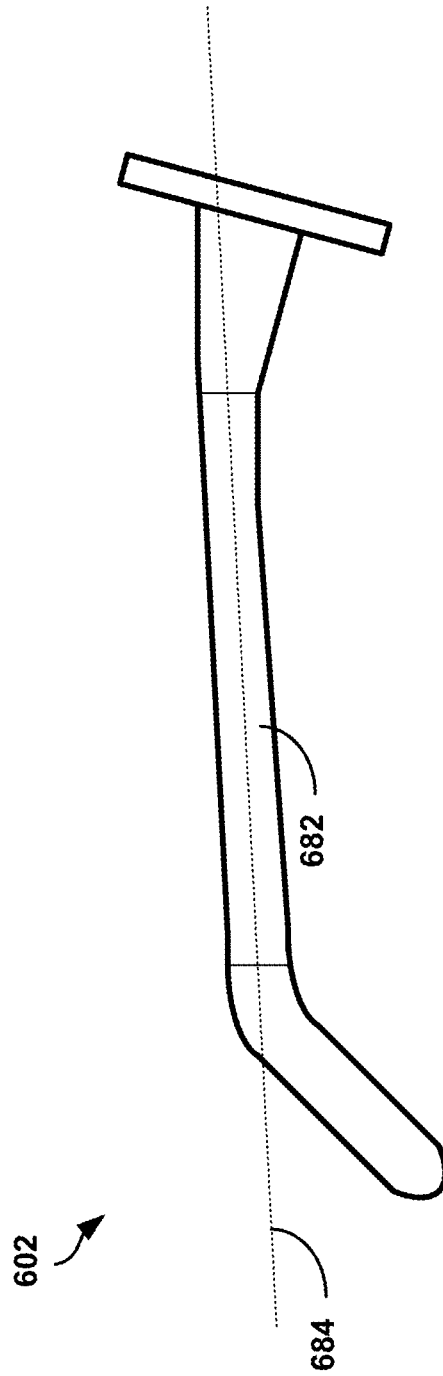


FIGURE 6C

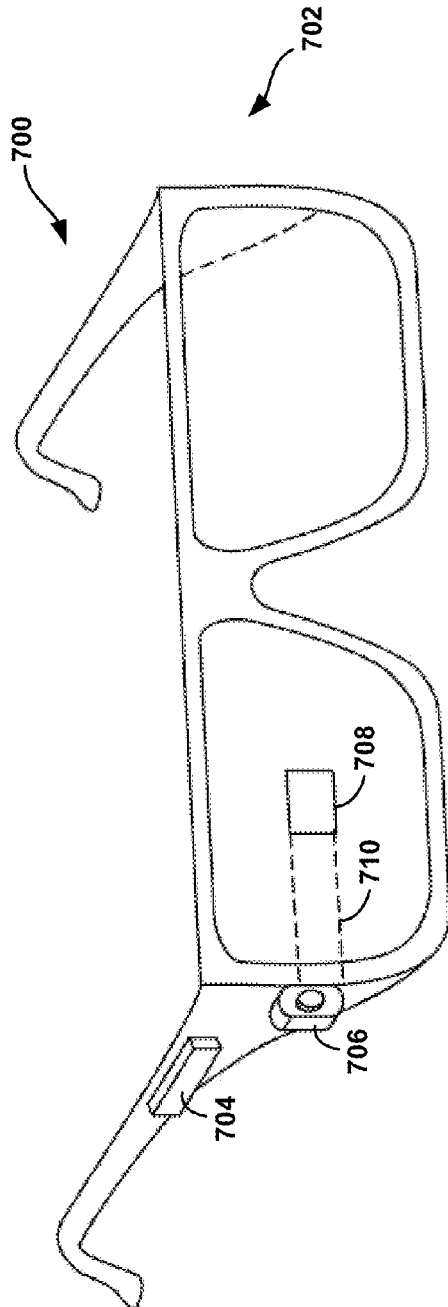


FIGURE 7A

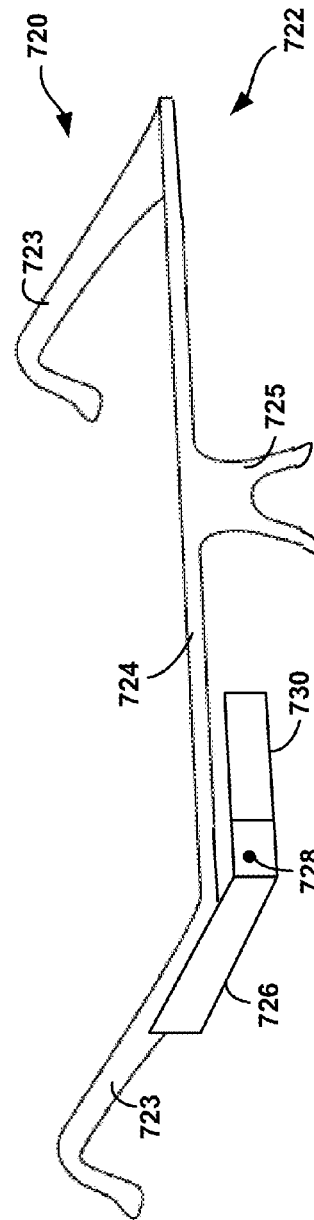


FIGURE 7B

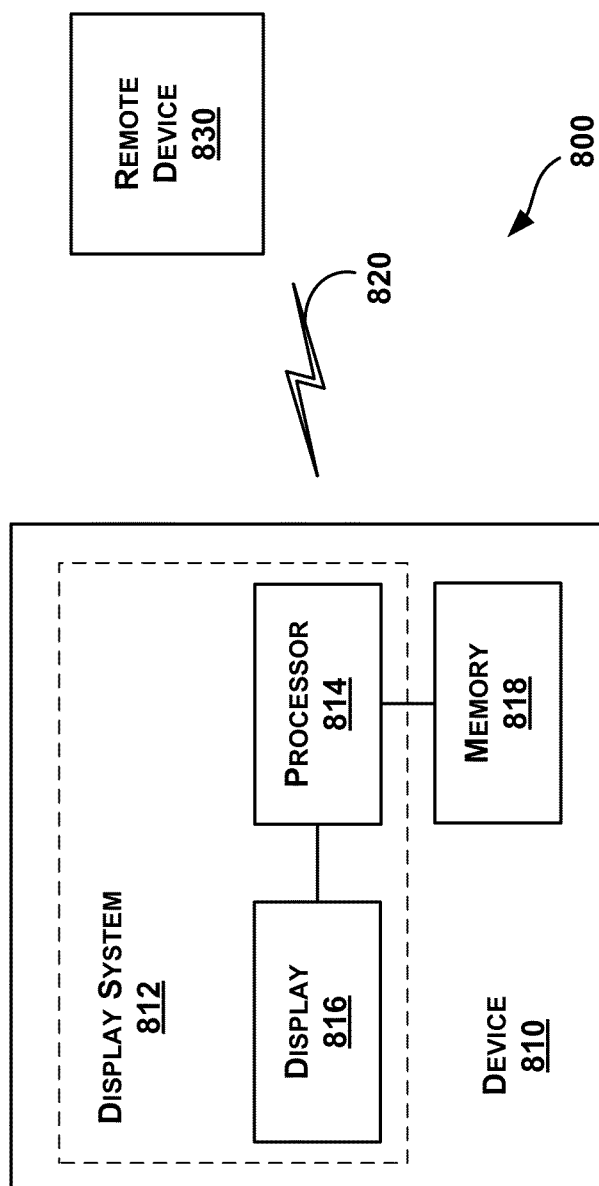
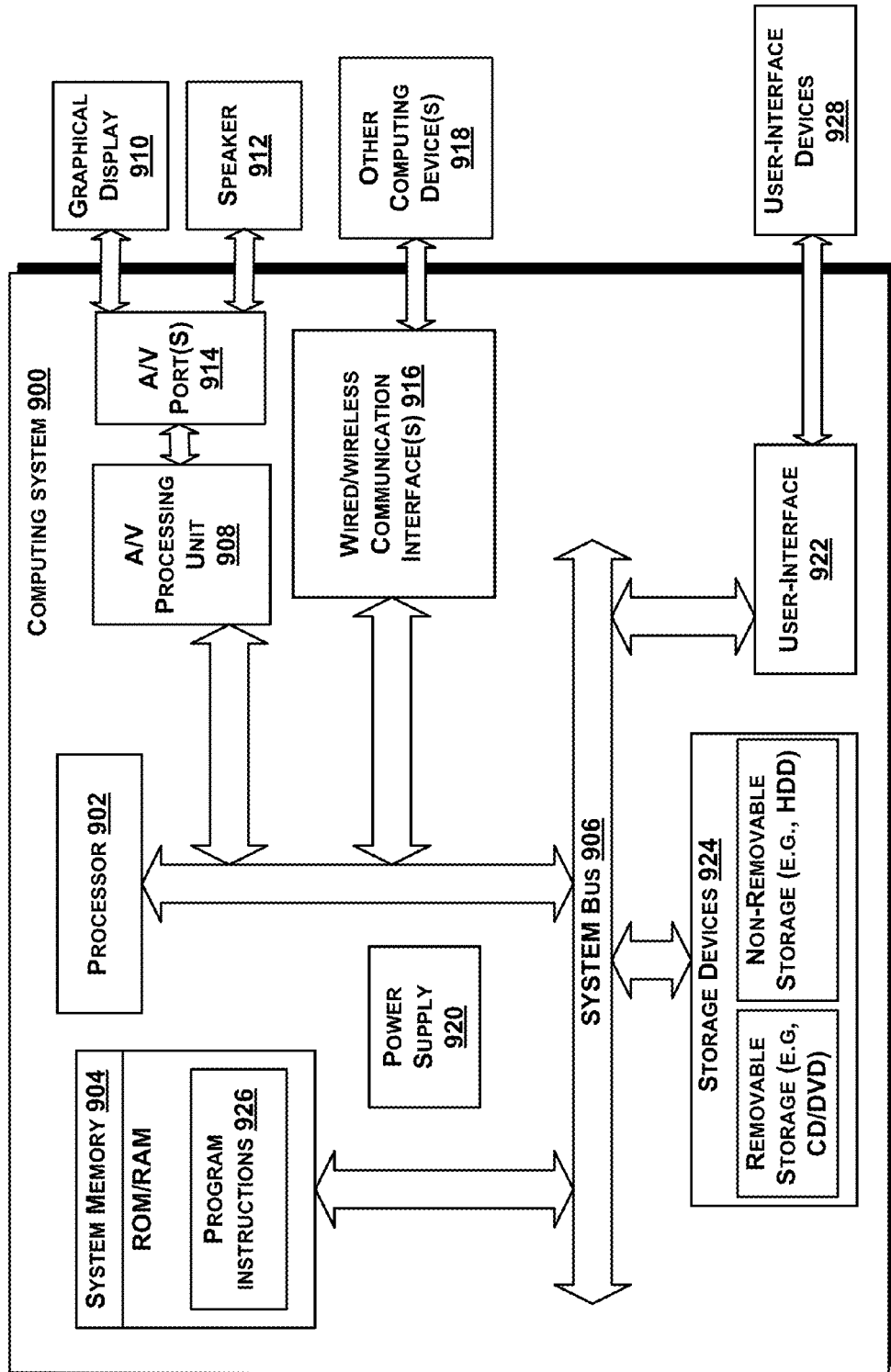


FIGURE 8

**FIGURE 9**

**TEXT INPUT ON TOUCH SENSITIVE
INTERFACE****CROSS-REFERENCE TO RELATED
APPLICATION**

The present application claims priority to U.S. Provisional Application Ser. No. 61/584,083, filed on Jan. 6, 2012, the entire contents of which are incorporated by reference.

BACKGROUND

Unless otherwise indicated herein, the materials described in this section are not prior art to the claims in this application and are not admitted to be prior art by inclusion in this section.

Computing systems such as personal computers, laptop computers, tablet computers, cellular phones, among many other types of computing systems, are increasingly prevalent in numerous aspects of modern life. As computers become progressively more integrated with users' everyday life, the convenience, efficiency, and intuitiveness of the user-interfaces by which users interact with computing devices becomes progressively more important.

A user-interface may include various combinations of hardware and software which enable the user to, among other things, interact with a computing system. One example of a modern user-interface is a "pointing device" that may allow a user to input spatial data into a computing system. The spatial data may be received and processed by the computing system, and may ultimately be used by the computing system as a basis for executing certain computing functions.

One type of pointing device may, generally, be based on a user touching a surface. Examples of common such pointing devices include a touchpad and a touch screen. Other examples of pointing devices based on a user touching a surface may exist as well. In some arrangements, the surface is a flat surface that can detect contact with the user's finger. For example, the surface may include electrode-sensors, capacitive sensors, resistive sensors, and/or other sensors that are arranged to transmit, to the computing system, data that indicates the pressure and direction of movement of the finger on the surface.

The computing system may be equipped with a graphical display that may, for example, provide a visual depiction of a graphical pointer that moves in accordance with the movement of the pointer. The graphical display may also provide a visual depiction of other objects that the user may manipulate, including, for example, a visual depiction of a graphical user-interface. The user may refer to such a graphical user-interface when inputting data. Implementations of a touchpad may involve a graphical display that is physically remote from the touchpad. However, a touchscreen is typically characterized by a touchpad embedded into a graphical display such that users may interact directly with a visual depiction of the graphical user-interface, and/or other elements displayed on the graphical display, by touching the graphical display itself.

User-interfaces may be arranged to provide various combinations of keys, buttons, and/or, more generally, input regions. Often, user-interfaces will include input regions that are associated with multiple characters and/or computing commands. Typically, users may select various characters and/or various computing commands, by performing various input actions on the user-interface.

However, often users must carry out complex and burdensome input procedures to select characters and/or computing commands. As a result, known methods for selecting charac-

ters and/or computing commands using such user-interfaces are often considered inconvenient, inefficient, and/or non-intuitive.

SUMMARY

The systems and methods described herein may help to provide for more convenient, efficient, and/or intuitive selection of characters via a touch-based user-interface.

In one example, a system with at least one processor and a non-transitory computer readable medium is provided. Program instructions may be stored on the non-transitory computer readable medium and may be executable by the at least one processor to perform functions. The functions may include providing a user-interface having a set of input areas. Each of the input areas may be associated with a character from a set of characters. The functions may also include determining at least one subset of input areas from the set of input areas. Determining the at least one subset of input areas may include receiving first touch input data indicating a first selection of a first input area from the set of input areas, and receiving second touch input indicating a second selection of a second input area from the set of input areas. The second input area may be in a given direction relative to the first input area. Determining the at least one subset of input areas may further include identifying the at least one subset of input areas based on at least (i) the first and second selected input areas and (ii) the given direction relative to the first input area. The functions may further include determining a word based on at least the at least one determined subset of input areas, and causing a visual depiction of the determined word to be provided on a graphical display.

In another example, a method is provided that includes providing a user-interface having a set of input areas. Each of the input areas may be associated with a character from a set of characters. The method may also include determining at least one subset of input areas from the set of input areas. Determining the at least one subset of input areas may include receiving first touch input data indicating a first selection of a first input area from the set of input areas, and receiving second touch input indicating a second selection of a second input area from the set of input areas. The second input area may be in a given direction relative to the first input area. Determining the at least one subset of input areas may further include identifying the at least one subset of input areas based on at least (i) the first and second selected input areas and (ii) the given direction relative to the first input area. The method may further include determining a word based on at least the at least one determined subset of input areas, and causing a visual depiction of the determined word to be provided on a graphical display.

In yet another example, a computer readable memory with instructions stored thereon is provided. The instructions may be executable by a computing device to cause the computing device to execute functions. The functions may include providing a user-interface having a set of input areas. Each of the input areas may be associated with a character from a set of characters. The functions may also include determining at least one subset of input areas from the set of input areas. Determining the at least one subset of input areas may include receiving first touch input data indicating a first selection of a first input area from the set of input areas, and receiving second touch input indicating a second selection of a second input area from the set of input areas. The second input area may be in a given direction relative to the first input area. Determining the at least one subset of input areas may further include identifying the at least one subset of input areas based

on at least (i) the first and second selected input areas and (ii) the given direction relative to the first input area. The functions may further include determining a word based on at least the at least one determined subset of input areas, and causing a visual depiction of the determined word to be provided on a graphical display.

These as well as other aspects, advantages, and alternatives, will become apparent to those of ordinary skill in the art by reading the following detailed description, with reference where appropriate to the accompanying drawings.

BRIEF DESCRIPTION OF THE FIGURES

FIG. 1A illustrates a block diagram of an example method for text input.

FIG. 1B illustrates a block diagram of an example method for determining at least one subset of input areas.

FIG. 2A illustrates an example touch interface including input areas corresponding to characters of the English alphabet.

FIG. 2B illustrates different types of touch inputs on an example touch interface.

FIG. 3 illustrates a first series of example touch inputs for entering a word.

FIG. 4 illustrates a second series of example touch inputs for entering the word.

FIG. 5A illustrates a third series of example touch inputs for entering the word.

FIG. 5B illustrates an example template for a word.

FIG. 6A illustrates an example system for receiving, transmitting, and displaying data.

FIG. 6B illustrates an alternate view of the system illustrated in FIG. 5A.

FIG. 6C illustrates an example system for receiving, transmitting, and displaying data.

FIG. 7A illustrates another example system for receiving, transmitting, and displaying data.

FIG. 7B illustrates yet another example system for receiving, transmitting, and displaying data.

FIG. 8 illustrates a simplified block diagram of an example computer network infrastructure.

FIG. 9 illustrates a simplified block diagram depicting example components of an example computing system.

DETAILED DESCRIPTION

In the following detailed description, reference is made to the accompanying figures, which form a part thereof. In the figures, similar symbols typically identify similar components, unless context dictates otherwise. The illustrative embodiments described in the detailed description, figures, and claims are not meant to be limiting. Other embodiments may be utilized, and other changes may be made, without departing from the spirit or scope of the subject matter presented herein. It will be readily understood that the aspects of the present disclosure, as generally described herein, and illustrated in the figures, can be arranged, substituted, combined, separated, and designed in a wide variety of different configurations, all of which are contemplated herein.

It should be understood that the word “exemplary” is used herein to mean “serving as an example, instance, or illustration.” Any embodiment or feature described herein as “exemplary” is not necessarily to be construed as preferred or advantageous over other embodiments or features. The exemplary embodiments described herein are not meant to be limiting. It will be readily understood that certain aspects of the disclosed systems and methods can be arranged and com-

bined in a wide variety of different configurations, all of which are contemplated herein. Further, other embodiments may be utilized, and other changes may be made, without departing from the scope of the subject matter presented herein.

1. Overview

In an example scenario, a user wearing a head-mountable device (HMD) may be interacting with a computing device, or a person accessing the computing device, by entering text using the HMD. The user may be entering text for the purpose of providing commands or inputs to the computing device, or for purposes of communicating with the person. In one case, the HMD may include a touch interface configured to receive touch inputs corresponding to text inputs. Additional information relating to the HMD, and how the HMD may capture signals representing an experience, can be found below in connection with FIGS. 6-9.

In one case, the touch interface of the HMD may have input areas corresponding to characters, and touch inputs received at the input areas may cause the respective corresponding characters to be entered. As such, the user may enter words by entering each character of the word. Each character of the word may be entered by providing a touch input at an input area corresponding to the character. In some instances, if the touch input is not initially provided at the input area corresponding to the character the user wishes to enter, the user may drag the touch input to the input area corresponding to the character the user wishes to enter before entering the character.

Rather than relying on the user to provide a touch input at a correct input area for each character of a word, however, the computing system may determine the word the user wishes to enter based on, for example, locations of touch inputs, touch input types, and distances between touch inputs. In some cases, implementation of the method on the HMD may result in faster and more intuitive entering of text by the user wearing the HMD. Implementation of the method may also allow the user to enter text correctly without requiring visual feedback from the HMD (for instance visual feedback indicating each character the user has entered), thereby allowing for “blind text input.”

While examples described herein may refer specifically to the use of an HMD with a touch interface, those skilled in the art will appreciate that any computing device may be configured to execute the methods described herein to achieve desired results.

2. Example Blind Text Input Method

FIG. 1A is a block diagram of an exemplary method **100** for blind text input, according to one embodiment of the present disclosure. Method **100** may include one or more operations, functions, or actions as illustrated by one or more of blocks **120-180**. Block **120** involves providing a user-interface including a set of input areas. Block **140** involves determining at least one subset of input areas from the set of input areas on the user-interface. Block **160** involves determining a word based on at least the determined subset of input areas. And block **180** involves causing a visual depiction of the determined word to be provided.

Although the blocks are illustrated in a sequential order, these blocks may also be performed in parallel, and/or in a different order than those described herein. Also, the various

blocks may be combined into fewer blocks, divided into additional blocks, and/or removed, depending upon the desired implementation.

In addition, for the method **100** and other processes and methods disclosed herein, the flowchart shows functionality and operation of one possible implementation of the present disclosure. In this regard, each block may represent a module, a segment, or a portion of program code, which includes one or more instructions executable by a processor for implementing specific logical functions or steps in the process. The program code may be stored on any type of computer readable medium, for example, such as a storage device including a disk or hard drive, as described later in FIGS. **8** and **9**. The computer readable medium may include non-transitory computer readable medium, for example, such as computer-readable media that stores data for short periods of time like register memory, processor cache and Random Access Memory (RAM). The computer readable medium may also include non-transitory media, such as secondary or persistent long term storage, like read only memory (ROM), optical or magnetic disks, compact-disc read only memory (CD-ROM), for example. The computer readable media may also be any other volatile or non-volatile storage systems. The computer readable medium may be considered a computer readable storage medium, for example, or a tangible storage device.

At block **120**, the method **100** involves providing a user-interface including a set of input areas. In one case, the input areas may be associated with a character from a set of characters. FIG. **2A** illustrates an example touch interface **200** including input areas corresponding to characters of the English alphabet. As shown, the touch interface **200** includes input areas **202-252**, each corresponding to a character in the English alphabet. In this example, the input areas **202-252** may be configured to correspond to respective characters according to the order of characters in the alphabet. In other examples, different arrangements of input areas may be configured according to different arrangements of characters. For instance, the input areas **202-252** may be arranged in the form of a “qwerty” keyboard and accordingly, the input areas **202-252** may correspond to characters arranged in a manner of the “qwerty” keyboard.

In addition to characters from the English alphabet, the set of characters may also include punctuations and other symbols. Further, additional input areas may be provided and configured for switching between upper and lower cases of the characters.

In one case, the touch interface **200** may be implemented on an extending side-arm of an HMD, such as a touch sensitive interface **682** discussed below in connection to FIG. **6C**. As such, a user may be able to access the touch interface **200** on the extending side-arm of the HMD, while wearing the HMD.

At block **140**, the method **100** involves determining at least one subset of input areas from the set of input areas. FIG. **1B** is a block diagram of steps corresponding to block **140**, which involves determining at least one subset of input areas, according to one embodiment of the present disclosure. Method **140** may include one or more operations, functions, or actions as illustrated by one or more of blocks **142-146**. Block **142** involves receiving a first touch input indicating a first selection of a first input area. Block **144** involves receiving a second touch input indicating a second selection of a second input area. And block **146** involves identifying at least one subset of input areas based on at least the first and second selected input areas.

Although the blocks are illustrated in a sequential order, these blocks may be performed in parallel, and/or in a differ-

ent order than those described herein. Also, the various blocks may be combined into fewer blocks, divided into additional blocks, and/or removed, depending upon the desired implementation.

At block **142**, the method **140** involves receiving first touch input data indicating a first selection of a first input area from the set of input areas. The first touch input data may be received from a user touching a touch interface such as the touch interface **200**. The first touch input data may indicate the first selection of the first input area based on a type of touch input the user may provide.

FIG. **2B** illustrates different types of touch inputs for an example touch interface. As shown on a subset of input areas of the touch interface **200**, the different types of touch inputs may include a land input **272**, a lift input **274**, a drag input **276**, and flick input **278**, and a dwell input **280**. In one example, the land input **272** may indicate a touch engagement with the touch interface **200**. In another example, the lift input **274** may indicate a touch disengagement from the user-interface. In yet another example, the drag input **276** may indicate continuous engagement between two input areas. As shown, the drag input **276** may be preceded by a land input on input area **224**, and end with a lift input on input area **228**, with the drag input **276** being between the input areas **224** and **228**. In a further example, the flick input **278** may indicate a directional disengagement from the user-interface. As shown, the directional disengagement of the flick input **278** on input area **230** is in the direction of input area **232**. In this case, the flick input **278** may also be preceded by a land input on input area **230**. In yet a further example, the dwell input **280** may indicate a stationary touch engagement of a given duration with the touch interface **200**. In the following discussions referencing the touch interface **200** of FIG. **2A**, “forward” refers to a direction towards input area **252**, and “backward” refers to a direction towards input area **202**.

Referring back to FIG. **1B**, block **144** of the method **140** involves receiving second touch input indicating a second selection of a second input area from the set of input areas. In one case, the second input area may be in a given direction relative to the first input area. Similar to the first touch input, the second touch input may indicate the second selection of the second input area based on a type of touch input the user may provide. The types of touch input the user may provide may also include the land input **272**, the lift input **274**, the drag input **276**, the flick input **278**, and the dwell input **280**, as described above in connection to FIG. **2B**.

At block **146**, the method **140** involves identifying the at least one subset of input areas based on at least the first and second selected input areas. The first and second selected input areas may represent a single input area, a pair of input areas, or a range of input areas, depending on the type of touch inputs and how the HMD may be configured. In one case, identifying the at least one subset of input areas may also be based on the given direction relative to the first input area.

In one example, the first touch input received at the first input area may be a land input. In one case, if the second touch input received at the second input area is a lift input, and the first and second input areas are the same, then the at least one subset of input areas may be the first and second input areas, which are the same in this case. Referring to FIG. **2A**, if the first touch input is a land input on input area **204**, and the second touch input is a lift input on input area **204**, then the at least one subset of input areas may be input area **204**. This series of touch inputs may also be referred to as a tap input.

In another case, the second touch input received at the second input area may also be a lift input, while the second input area may be different from the first input area. In one

instance, the at least one subset of input areas may include the input areas located between the first and second input areas. Referring to FIG. 2A, if the first touch input is a land input on input area **204**, and the second touch input is a lift input on input area **232**, then the at least one subset of input areas may include input areas **206-230**. In this instance, the at least one subset of input areas may or may not include the first or second input areas. As such, the at least one subset of input areas may or may not include input areas **204** or **232**.

In another instance, the at least one subset of input areas may include all available input areas in the direction of the second input area, starting from the first input area. Continuing with the previous example, the at least one subset of input areas may include input areas **204** (or **205**)-**252**. Again in this instance, the at least one subset of input areas may or may not include the first input area. As such, the at least one subset of input areas may or may not include input area **204**.

In another example, the first touch input received at the first input area may be a land input, and the second touch input may be a flick input received at the second input area, which may be an input area adjacent to the first input area. In this case, the at least one subset of input areas may include all available input areas in the direction of the second input area. Referring to FIG. 2A, the first touch input may be a land input on input area **208**, and the second touch input may be a flick input at the input area **210**, adjacent to input areas **208**. In other words, the flick input may be a forward flick. As such, the at least one subset of input areas may include available input areas in the direction of input area **210** relative to input area **208**, including input areas **210-252**. In this case, the at least one subset of input areas may or may not include the first input area. Accordingly, the at least one subset of input areas may or may not include input area **208**.

In addition to the first and second touch input data indicating first and second selections of first and second input areas, the method **140** may further involve receiving third touch input data indicating a third selection of a third input area from the set of input areas. In this case, determining the at least one subset of input areas may also be based on the third input area.

In one example, the first touch input may be a land input at the first input area, the second touch input may be a drag input received over the second input area, and the third touch input may be a lift input at the third input area. In one case, the second input area may include a range of input areas. In this case, the at least one subset of input areas may include the range of input areas included in the second input area. Referring to FIG. 2A, the first touch input may be a land input at input area **212**, the second touch input may be a drag input over input areas **214-234**, and the third touch input may be a lift input at input area **236**. In other words, the second touch input may be a forward drag. As such, the at least one subset of input areas may include input areas **214-234**. In this instance, the at least one subset of input areas may or may not include the first input area. Accordingly, the at least one subset of input areas may or may not include input areas **212** or **236**. As discussed, determining the at least one subset of input areas may be based on at least the first and second selected input areas, and the first, second, and third selected input areas.

While the above discussions refer to a flick input as having two touch inputs indicating selections of two input areas, flick inputs may be considered as a single touch input indicating a range of input areas. Similarly, a drag input may be considered a single touch input or a pair of touch inputs indicating a range of input areas. Determination of how the different types of touch inputs are evaluated by the computing system may

depend on different implementations of the method **100** and configurations of user touch interfaces such as the touch interface **200**.

Referring back to FIG. 1A, block **160** of the method **100** involves determining a word based on at least the at least one determined subset of input areas. As discussed above, each of the input areas correspond to a character. As such, the at least one determined subset of input areas represent a subset of characters that, one of which the user may wish to type to form a character of a word the user wishes to type. Accordingly, the word may be determined based on the at least one determined subset of characters in a number of ways. The examples discussed herein are intended as a sample of the different methods and considerations that may be implemented to determine a word based on a determined subset of characters, and therefore should not be taken to be limiting.

In one case, a probability for each character in the subset of characters may be determined according to a prevalence of each character in commonly used words. In another case, the probability for each character may be assigned based on distances between the locations of the corresponding input areas and where a land input is provided. In this case, the probability assigned to a character having a corresponding input area near the input area where the land input is provided may be higher than the probability assigned to a character having a corresponding input area far from the input area where the land input is provided. In yet another case, the probability for each character may be assigned based on context. For example, if a preceding character is a letter “q,” then the current character may more likely be a letter “u” than a letter “i.” In a further case, the probability for each character may be determined based on a combination of any or each of the above.

Whichever the case, the word may be determined based at least in part on the probabilities of the characters in the subset of characters. In addition, probabilities of words which have characters in the determined subset of characters may also be considered. In one case, the probabilities of words may be determined based on occurrence probabilities of words which have characters in the subset of characters. In another case, the probabilities of words may also be based on context. For example, if a preceding word is a noun, then the current word may more likely be a verb than another noun.

In one case, the word may be determined once the subsets of characters have been determined for each character of the word the user wishes to enter. This may be based on the user providing an input indicating that the user has completed entering the word. In another case, the word may be determined after each subset of characters has been determined. In such a case, a refined word may be provided after a subsequent subset of characters has been determined.

In this case, the method **100** may involve receiving third touch input data indicating a third selection of a third input area from the set of input areas. In one case, identifying the at least one subset of input areas may be based on at least (i) the first and second selected input areas, and (ii) the first, second, and third input areas. In another case, a refined-subset of input areas may be identified based on at least the second and third selected input areas. In one instance, the third touch input data indicating the third selection of the third input area may further define, and thereby refine the at least one determined subset of input areas. In other words, the refined-subset of input areas may be a subset of the at least one determined subset of input areas. The refined word may then be determined based on at least the at least one determined subset of

input areas and the refined subset of input areas. In some cases, the refined word may be the same as the previously determined word.

At block **180**, the method **100** involves causing a visual depiction of the determined word to be provided on a graphical display. The graphical display may be similar to a display **708** discussed below in connection to FIG. **7B**. In one example, the visual depiction of the determined word may be provided to the user to prompt the user to either accept the determined word or reject the determined word. In the case the word may be determined after each subset of characters has been determined, the visual depiction of the determined word may be updated with the refined word each time a refined word is determined. In some cases, more than one word may be determined. In these cases, each of the determined words may be provided on the graphical display for the user to select. In such cases, each of the determined words may be provided on the graphical display in an order according to factors such as a prevalence or a context associated with each of the words.

3. Example Blind Text Input Scenarios

According to methods **100** and **140** discussed above, other methods for determining words the user wishes to enter may be implemented based on specific configurations of touch input types. Below are two blind text input methods based on specific configurations of touch input types, described through text input scenarios.

a. Blind Flick/Scratch Text Input

One method may be implemented based on flick and drag touch inputs. FIG. **3** illustrates a first series of example touch inputs for entering a word THEIR. As shown, the series of example touch inputs are provided on touch interface **200** and include flick inputs **312**, **322**, and **342**, and a drag input **352**. As shown, the flick input **312** provided by the user may land on input area **228** corresponding to the letter N and include a forward flick, indicating that the first letter is in the range of O-Z.

The next letter in the word is H. As such, the user may then attempt to land somewhere before input area **228** corresponding to the letter N. As shown, the flick input **322** provided by the user may land on input area **220** corresponding to the letter J and include a backward flick, indicating that the second letter is in the range of A-I.

The next letter in the word is E. As such, the user may attempt to land somewhere before input area **220** corresponding to the letter J. As shown, the flick input **332** provided by the user may land on input area **206** corresponding to the letter C and include a forward flick. In this case, input area **206** corresponding to the letter C is before input area **220** corresponding to the letter J, indicating the user moved backward from the letter J to provide the flick input **332**. As such, the third letter may be determined to be in the range of D-I, rather than D-Z.

The next letter in the word is I. As such, the user may attempt to land somewhere after input area **206** corresponding to the letter C. As shown, the flick input **342** provided by the user may land on input area **222** corresponding to the letter k and include a backward flick. Similar to the case discussed above in reference to the third letter, the fourth letter may be determined to be in the range of D-J rather than A-J.

The last letter in the word is R. As such, the user may attempt to land somewhere after input area **228** corresponding to the letter N, and where flick input **312** was provided. As shown, the drag input **352** may land on input area **238** corresponding to the letter S and lift from input area **236** corre-

sponding to the letter R. In another case, the user may land on the input area **238** corresponding to the letter S and flick backward such that the fifth letter may be determined to be in the range of O-R. However, because the input area **236** corresponding to the letter R is adjacent to the input area **238** corresponding to the letter S, the user may decide to provide a drag input to the input area **236** corresponding to the letter R, and lifting from the input area **236** corresponding to the letter R to indicate that the fifth letter is R. This series of inputs including a drag input toward and a lift input from an input area corresponding to the letter the user wishes to enter may be referred to as a "scratch."

Accordingly, the subset of characters for each letter in the word the user wishes to enter has been determined. As discussed above, the first letter is in the range O-Z, the second letter is in the range A-I, the third letter is in the range D-I, the fourth letter is in the range D-J and the fifth letter is R. Based on these ranges, a dictionary of words may be used to determine a five-lettered word or list of five-lettered words having letters meeting the corresponding subset of characters. The determined word or list of words may then be provided for the user to accept or select. Alternatively, the most-likely intended word from the list of words may be automatically selected.

The first blind text input method discussed above in connection to FIG. **3** may also incorporate drag inputs in addition to the drag input **352**. Rather than providing a flick input in the direction of the letter the user wishes to enter, the user may provide a drag input in the direction of the letter the user wishes to enter and passing the letter. If the provided drag input passes the letter the user wishes to enter by a relatively small margin, the user may "scratch" over the letter to indicate that the user wishes to enter the letter, as discussed above in connection to the drag input **352** and the fifth letter R.

In one case, if the user does not provide a "scratch" input, a drag trace of the drag input may be recorded, and a range of characters corresponding to input areas covered by the drag trace may be determined as the subset of characters. FIG. **4** illustrates a second series of example touch inputs for entering the first two letters of the word THEIR using the touch interface **200**. As shown, a drag input **404** is provided from input area **228** corresponding to the letter N to input area **242** corresponding to the letter U. Based on a drag trace of the drag input **404**, the first letter of the word the user wishes to enter is in the range of O-U. In addition, a probability may be assigned to each letter in the range of O-U based on distances between the corresponding input areas and where the drag trace ends. In other words, because the user provided a drag input in the direction of the letter the user wishes to enter and passing the letter, the letter the user wishes to enter may be nearer the end of the drag trace than the beginning. As such, a ranking of probabilities of letters in the range of O-U may be determined by back-tracking along the drag trace. Accordingly, the ranking of the probabilities of letters in the range of O-U may indicate that the letter U has the highest probability of being the letter the user wishes to enter, followed by T, S and so on.

To enter the second letter H, the user may land on input area **224** corresponding to the letter L and provide a drag input **416** towards input area **216** corresponding to the letter H. However, the drag input **416** may overshoot input area **216** corresponding to the letter H substantially. In this case, the user may provide the drag input **416** back towards the input area **216** corresponding to the letter H. As such, the drag trace starts at input area **224** corresponding to the letter L and ends at input area **218** corresponding to the letter I, passing through

all input areas between input area **224** corresponding to the letter L and input area **210** corresponding to the letter E.

As with the case above in reference to the first letter T, a probability may be assigned to each letter in the range of E-L based on distances between the corresponding input areas and where the drag trace ends. In this case, the end of the drag trace is in the middle of the range of E-L, and a ranking of the probabilities of letters in the range of E-L determined based on back-tracking the drag trace may indicate that the letter I has the highest probability of being the letter the user wishes to enter, followed by H, G, F, E, J, K, and finally L.

b. Blind Tap Text Input

Another blind text input method may be implemented based on tap inputs. Note that while this second method may be implemented based on tap inputs, drag inputs and scratch inputs may also be incorporated, as with the blind flick/scratch text input method described previously.

The blind tap text input method includes generating an array of tap input vectors and comparing the array of tap input vectors against a plurality of word vector templates. Each of the plurality of word vector templates corresponds to a word. FIG. 5A illustrates a series of touch inputs provided by a user intending to enter the word THEIR on the touch interface **200**. As shown, a series of tap inputs **502**, **504**, **506**, **508**, and **510** may be provided by a user. As the user provides each tap input, an input-vector array **530** may be generated.

For each tap input, a vector specifying a direction and a distance between the given tap input and a previous tap input may be generated. In one case, in which the tap input is the first of a series of tap inputs, the direction and distance may be determined in reference to a reference point. The reference point may provide a relative location from where the first vector is generated. The reference point may be any predetermined location on the touch interface, so long as a same reference point is used for the plurality of word vector templates. In another case, the first of a series of tap inputs may be determined as the reference point. In such a case, the first vector of each word vector template, may be considered the reference point for the given word vector template when comparing the tap input vectors against the word vector templates.

In one example, the reference point may be the input area **202**, corresponding to the letter A. As shown, the first tap input **502** is at a location which is a distance v, in a forward direction from the reference point. As such, a first vector indicating a forward distance of v may be added to the input-vector array **530**.

Next, the second tap input **504** is at a location which is a distance w, in a backward direction from the location of the first tap input **502**. As such, a second vector indicating a backward distance of w may be added to the input-vector array **530**.

Next, the third tap input **506** is at a location which is a distance x, in a backward direction from the location of the second tap input **504**. As such, a third vector indicating a backward distance of x may be added to the input-vector array **530**.

Next, the fourth tap input **508** is at a location which is a distance y, in a forward direction from the location of the third tap input **506**. As such, a fourth vector indicating a forward distance of y may be added to the input-vector array **530**.

Finally, the fifth tap input **510** is at a location which is a distance z, in a forward direction from the location of the fourth tap input **508**. As such, a fifth vector indicating a forward distance of z may be added to the input-vector array **530**.

Note that in this case, due to the use of a predetermined reference point, the input-vector array **530** may include five vectors for five tap inputs. In other words, the input-vector array **530** may have a number of vectors matching the number of tap inputs. In the case that the first tap input is used as the reference point, the input-vector array **530** may include only four vectors for five tap inputs. In this case, the input-vector array **530** may have a number of vectors one less than the number tap inputs.

Once the input-vector array **530** has been generated, the vectors in the input-vector array **530** may be modified or scaled to account for human factors. For instance, the perceived distance between two tap inputs by the user may not be linear as may be the case with the configuration of input areas on the touch interface **200**. In fact, the distance perceived by the user may be different from the actual distance on the touch interface **200** by a logarithmic factor. As such, the distance components of each input vector in the input-vector array may be modified by a logarithmic factor such that the input vectors may better represent the distances between each tap input, as intended by the user. On the other hand, the plurality of word vector templates may be modified or scaled by an inverse logarithmic factor to adapt the linear distances between input areas of the touch interface **200** to better match the distances between input areas as perceived by the user.

Once the input-vector array **530** has been modified or scaled to account for human factors, the input-vector array **540** may be compared against a word vector template. FIG. 5B illustrates an example word vector template **580** for the word THEIR. As shown, the word vector template **580** includes vectors indicating distances and directions between accurate and precise tap inputs **552**, **554**, **556**, **558**, and **560** for entering the word THEIR. The first tap input **552** is located on input area **240**, a forward distance of a from the reference point, which is the location of input area **202**, corresponding to the letter A. The second tap input **554** is located on input area **216**, a backward distance b from the location of the first tap input **552** at input area **240**. The third tap input **556** is located on input area **210**, a backward distance c from the location of the second tap input **554** at input area **216**. The fourth tap input **558** is located on input area **218**, a forward distance d from the location of the third tap input **556** at input area **210**. Finally, the fifth tap input **560** is located on input area **236**, a forward distance e from the location of the fourth tap input **558** at input area **218**.

The input-vector array **530** may be compared to the plurality of word vector templates such as the word vector template **580** based on various algorithms. For instance, the differences between distances and directions for each corresponding vector may be determined and averaged. In other words, when comparing the input-vector array **530** against the word vector template **580**, the distances between vectors a and v, b and w, c and x, d and y, and e and z may be averaged to determine a similarity score between the input-vector array **530** and the word vector template **580**.

In addition to determining similarity scores between the input-vector array **530** and the plurality of word vector templates, occurrence probabilities of the words corresponding to the word vector templates may also be considered. For instance, the similarity score between the input-vector array **530** and a word vector template for the word PECHO may be higher than the similarity score between the input-vector array **530** and the word vector template for the word THEIR. In this case, THEIR may be a more commonly used word than PECHO, and may therefore be determined as the word the user wishes to enter rather than PECHO. Similarly, context, including parts of speech may also be considered when deter-

mining the word the user wishes to enter. In some cases, any word corresponding to a word vector template having a similarity score above a predetermined threshold value may be provided for the user to select.

In the above example, the input-vector array 530 is compared against the plurality of word vector templates after each tap input to enter the word THEIR has been provided by the user. In a further example, the input-vector array 530 may be compared against the plurality of word vector templates starting when the first tap input has been provided by the user. For example, after tap inputs 502 and 504 have been provided, the input-vector array 530 which may only have two input vectors may be compared against the first two input vectors of each word vector template in the plurality of word vector templates. In this case, word vector templates starting with two vectors in forward directions may be eliminated because having two vectors in forward directions indicate that the input area corresponding to the second character is after input area corresponding to the first character, while the first two vectors in the input-vector array 530 indicate that the input area corresponding to the second character is before the input area corresponding to the first letter.

After receiving the third tap input, the input-vector array 530, now with three vectors, may be compared against the first three vectors of the remaining plurality of word vector templates that have not already been eliminated based on the first two vectors. Comparison between the input-vector array 530 and word vector templates from the plurality of word vector templates may become more computationally intensive due to the increased number of vectors being compared. In this case however, the input-vector array 530 may be compared against fewer word vector templates from the plurality of word vector templates as the number of vectors being compared increases. As a result, the computational requirements for determining relatively long words may be curbed.

4. Example System and Device Architecture

FIG. 6A illustrates an example system 600 for receiving, transmitting, and displaying data. The system 600 is shown in the form of a wearable computing device, which may be implemented as the HMD discussed above, for receiving touch input data. While FIG. 6A illustrates a head-mountable device 602 as an example of a wearable computing device, other types of wearable computing devices could additionally or alternatively be used. As illustrated in FIG. 6A, the head-mountable device 602 has frame elements including lens-frames 604, 606 and a center frame support 608, lens elements 610, 612, and extending side-arms 614, 616. The center frame support 608 and the extending side-arms 614, 616 are configured to secure the head-mountable device 602 to a user's face via a user's nose and ears, respectively.

Each of the frame elements 604, 606, and 608 and the extending side-arms 614, 616 may be formed of a solid structure of plastic and/or metal, or may be formed of a hollow structure of similar material so as to allow wiring and component interconnects to be internally routed through the head-mountable device 602. Other materials may be possible as well.

One or more of each of the lens elements 610, 612 may be formed of any material that can suitably display a projected image or graphic. Each of the lens elements 610, 612 may also be sufficiently transparent to allow a user to see through the lens element. Combining these two features of the lens elements may facilitate an augmented reality or heads-up display

play where the projected image or graphic is superimposed over a real-world view as perceived by the user through the lens elements 610, 612.

The extending side-arms 614, 616 may each be projections that extend away from the lens-frames 604, 606, respectively, and may be positioned behind a user's ears to secure the head-mountable device 602 to the user. The extending side-arms 614, 616 may further secure the head-mountable device 602 to the user by extending around a rear portion of the user's head. Additionally or alternatively, for example, the system 600 may connect to or be affixed within a head-mountable helmet structure. Other possibilities exist as well.

The system 600 may also include an on-board computing system 618, a video camera 620, a sensor 622, and a finger-operable touch pad 624. The on-board computing system 618 is shown to be positioned on the extending side-arm 614 of the head-mountable device 602; however, the on-board computing system 618 may be provided on other parts of the head-mountable device 602 or may be positioned remote from the head-mountable device 602 (e.g., the on-board computing system 618 could be connected by wires or wirelessly connected to the head-mountable device 602). The on-board computing system 618 may include a processor and memory, for example. The on-board computing system 618 may be configured to receive and analyze data from the video camera 620, the sensor 622, and the finger-operable touch pad 624 (and possibly from other sensory devices, user-interfaces, or both) and generate images for output by the lens elements 610 and 612. The on-board computing system 618 may additionally include a speaker or a microphone for user input (not shown). An example computing system is further described below in connection with FIG. 7.

The video camera 620 is shown positioned on the extending side-arm 614 of the head-mountable device 602; however, the video camera 620 may be provided on other parts of the head-mountable device 602. The video camera 620 may be configured to capture images at various resolutions or at different frame rates. Video cameras with a small form-factor, such as those used in cell phones or webcams, for example, may be incorporated into an example embodiment of the system 600.

Further, although FIG. 6A illustrates one video camera 620, more video cameras may be used, and each may be configured to capture the same view, or to capture different views. For example, the video camera 620 may be forward facing to capture at least a portion of the real-world view perceived by the user. This forward facing image captured by the video camera 620 may then be used to generate an augmented reality where computer generated images appear to interact with the real-world view perceived by the user.

The sensor 622 is shown on the extending side-arm 616 of the head-mountable device 602; however, the sensor 622 may be positioned on other parts of the head-mountable device 602. The sensor 622 may include one or more of a gyroscope or an accelerometer, for example. Other sensing devices may be included within, or in addition to, the sensor 622 or other sensing functions may be performed by the sensor 622.

The finger-operable touch pad 624 is shown on the extending side-arm 614 of the head-mountable device 602. In this configuration, the touchpad 624 may be outside a field of view of a wearer of the system 600. However, the finger-operable touch pad 624 may be positioned on other parts of the head-mountable device 602. Also, more than one finger-operable touch pad may be present on the head-mountable device 602. The finger-operable touch pad 624 may be used by a user to input commands. The finger-operable touch pad 624 may sense at least one of a position and a movement of a finger via

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capacitive sensing, resistance sensing, or a surface acoustic wave process, among other possibilities. The finger-operable touch pad **624** may be capable of sensing finger movement in a direction parallel or planar to the pad surface, in a direction normal to the pad surface, or both, and may also be capable of sensing a level of pressure applied to the pad surface. The finger-operable touch pad **624** may be formed of one or more translucent or transparent insulating layers and one or more translucent or transparent conducting layers. Edges of the finger-operable touch pad **624** may be formed to have a raised, indented, or roughened surface, so as to provide tactile feedback to a user when the user's finger reaches the edge, or other area, of the finger-operable touch pad **624**. If more than one finger-operable touch pad is present, each finger-operable touch pad may be operated independently, and may provide a different function.

FIG. 6B illustrates an alternate view of the system **600** illustrated in FIG. 6A. As shown in FIG. 6B, the lens elements **610**, **612** may act as display elements. The head-mountable device **602** may include a first projector **628** coupled to an inside surface of the extending side-arm **616** and configured to project a display **630** onto an inside surface of the lens element **612**. Additionally or alternatively, a second projector **632** may be coupled to an inside surface of the extending side-arm **614** and configured to project a display **634** onto an inside surface of the lens element **610**.

The lens elements **610**, **612** may act as a combiner in a light projection system and may include a coating that reflects the light projected onto them from the projectors **628**, **632**. In some embodiments, a reflective coating may be omitted (e.g., when the projectors **628**, **632** are scanning laser devices).

In alternative embodiments, other types of display elements may also be used. For example, the lens elements **610**, **612** themselves may include: a transparent or semi-transparent matrix display, such as an electroluminescent display or a liquid crystal display, one or more waveguides for delivering an image to the user's eyes, or other optical elements capable of delivering an in focus near-to-eye image to the user. A corresponding display driver may be disposed within the frame elements **604**, **606** for driving such a matrix display. Alternatively or additionally, a laser or light emitting diode (LED) source and scanning system could be used to draw a raster display directly onto the retina of one or more of the user's eyes. Other possibilities exist as well.

FIG. 6C depicts another alternate view of another wearable computing system according to an example embodiment. More particularly, FIG. 6E depicts an alternate view of an extending side-arm. As shown, the extending side-arm is configured to include a touch sensitive interface **682**, having a longitudinal axis **684**, along the side arm. Touch sensitive interface **682** may be a finger-operable touch pad as described above. Generally, touch sensitive interface **682** may take on any suitable touch-based interface form including, for example, electrode-based, capacitance-based, and/or resistance-based forms, among others, similar to the finger-operable touch pad **624** shown in FIG. 6A.

FIG. 7A illustrates an example system **700** for receiving, transmitting, and displaying data. The system **700** is shown in the form of a wearable computing device **702**, which may be implemented as the HMD discussed above, for receiving input data. The wearable computing device **702** may include frame elements and side-arms such as those described with respect to FIGS. 6A and 6B. The wearable computing device **702** may additionally include an on-board computing system **704** and a video camera **706**, such as those described with respect to FIGS. 6A and 6B. The video camera **706** is shown

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mounted on a frame of the wearable computing device **702**; however, the video camera **706** may be mounted at other positions as well.

As shown in FIG. 7A, the wearable computing device **702** may include a single display **708** which may be coupled to the device. The display **708** may be formed on one of the lens elements of the wearable computing device **702**, such as a lens element described with respect to FIGS. 6A and 6B, and may be configured to overlay computer-generated graphics in the user's view of the physical world. The display **708** is shown to be provided in a center of a lens of the wearable computing device **702**, however, the display **708** may be provided in other positions. The display **708** is controllable via the computing system **704** that is coupled to the display **708** via an optical waveguide **710**.

FIG. 7B illustrates an example system **720** for receiving, transmitting, and displaying data. The system **720** is shown in the form of a wearable computing device **722**. The wearable computing device **722** may include side-arms **723**, a center frame support **724**, and a bridge portion with nosepiece **725**. In the example shown in FIG. 7B, the center frame support **724** connects the side-arms **723**. The wearable computing device **722** does not include lens-frames containing lens elements. The wearable computing device **722** may additionally include an on-board computing system **726** and a video camera **728**, such as those described with respect to FIGS. 6A and 6B.

The wearable computing device **722** may include a single lens element **730** that may be coupled to one of the side-arms **723** or the center frame support **724**. The lens element **730** may include a display such as the display described with reference to FIGS. 6A and 6B, and may be configured to overlay computer-generated graphics upon the user's view of the physical world. In one example, the single lens element **730** may be coupled to a side of the extending side-arm **723**. The single lens element **730** may be positioned in front of or proximate to a user's eye when the wearable computing device **722** is worn by a user. For example, the single lens element **730** may be positioned below the center frame support **724**, as shown in FIG. 7B.

FIG. 8 shows a simplified block diagram of an example computer network infrastructure. In system **800**, a device **810** communicates using a communication link **820** (e.g., a wired or wireless connection) to a remote device **830**. The device **810** may be any type of device that can receive input data. For example, the device **810** may be a heads-up display system, such as the head-mountable device **602**, **700**, or **720** described with reference to FIGS. 6A-7B.

Thus, the device **810** may include a display system **812** including a processor **814** and a display **816**. The display **816** may be, for example, an optical see-through display, an optical see-around display, or a video see-through display. The processor **814** may receive data from the remote device **830**, and configure the data for display on the display **816**. The processor **814** may be any type of processor, such as a micro-processor or a digital signal processor, for example.

The device **810** may further include on-board data storage, such as memory **818** coupled to the processor **814**. The memory **818** may store software that can be accessed and executed by the processor **814**, for example.

The remote device **830** may be any type of computing device or transmitter including a laptop computer, a mobile telephone, or tablet computing device, etc., that is configured to transmit data to the device **810**. The remote device **830** and the device **810** may contain hardware to enable the communication link **820**, such as processors, transmitters, receivers, antennas, etc.

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In FIG. 8, the communication link 820 is illustrated as a wireless connection; however, wired connections may also be used. For example, the communication link 820 may be a wired serial bus such as a universal serial bus or a parallel bus, among other connections. The communication link 820 may also be a wireless connection using, e.g., Bluetooth® radio technology, communication protocols described in IEEE 802.11 (including any IEEE 802.11 revisions), Cellular technology (such as GSM, CDMA, UMTS, EV-DO, WiMAX, or LTE), or Zigbee® technology, among other possibilities. Either of such a wired and/or wireless connection may be a proprietary connection as well. The remote device 830 may be accessible via the Internet and may include a computing cluster associated with a particular web service (e.g., social-networking, photo sharing, address book, etc.).

As described above in connection with FIGS. 6A-7B, an example wearable computing device may include, or may otherwise be communicatively coupled to, a computing system, such as computing system 618 or computing system 704. FIG. 9 shows a simplified block diagram depicting example components of an example computing system 900. One or both of the device 810 and the remote device 830 may take the form of computing system 900.

Computing system 900 may include at least one processor 902 and system memory 904. In an example embodiment, computing system 900 may include a system bus 906 that communicatively connects processor 902 and system memory 904, as well as other components of computing system 900. Depending on the desired configuration, processor 902 can be any type of processor including, but not limited to, a microprocessor (μP), a microcontroller (μC), a digital signal processor (DSP), or any combination thereof. Furthermore, system memory 904 can be of any type of memory now known or later developed including but not limited to volatile memory (such as RAM), non-volatile memory (such as ROM, flash memory, etc.) or any combination thereof.

An example computing system 900 may include various other components as well. For example, computing system 900 includes an A/V processing unit 908 for controlling graphical display 910 and speaker 912 (via A/V port 914), one or more communication interfaces 916 for connecting to other computing devices 918, and a power supply 920. Graphical display 910 may be arranged to provide a visual depiction of various input regions provided by user-interface module 922. For example, user-interface module 922 may be configured to provide a user-interface, and graphical display 910 may be configured to provide a visual depiction of the user-interface. User-interface module 922 may be further configured to receive data from and transmit data to (or be otherwise compatible with) one or more user-interface devices 928.

Furthermore, computing system 900 may also include one or more data storage devices 924, which can be removable storage devices, non-removable storage devices, or a combination thereof. Examples of removable storage devices and non-removable storage devices include magnetic disk devices such as flexible disk drives and hard-disk drives (HDD), optical disk drives such as compact disk (CD) drives or digital versatile disk (DVD) drives, solid state drives (SSD), and/or any other storage device now known or later developed. Computer storage media can include volatile and nonvolatile, removable and non-removable media implemented in any method or technology for storage of information, such as computer readable instructions, data structures, program modules, or other data. For example, computer storage media may take the form of RAM, ROM, EEPROM, flash memory or other memory technology, CD-ROM, digital ver-

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satile disks (DVD) or other optical storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other medium now known or later developed that can be used to store the desired information and which can be accessed by computing system 900.

According to an example embodiment, computing system 900 may include program instructions 926 that are stored in system memory 904 (and/or possibly in another data-storage medium) and executable by processor 902 to facilitate the various functions described herein including, but not limited to, those functions described with respect to FIG. 1. Although various components of computing system 900 are shown as distributed components, it should be understood that any of such components may be physically integrated and/or distributed according to the desired configuration of the computing system.

5. Conclusion

It should be understood that arrangements described herein are for purposes of example only. As such, those skilled in the art will appreciate that other arrangements and other elements (e.g. machines, interfaces, functions, orders, and groupings of functions, etc.) can be used instead, and some elements may be omitted altogether according to the desired results. Further, many of the elements that are described are functional entities that may be implemented as discrete or distributed components or in conjunction with other components, in any suitable combination and location.

While various aspects and embodiments have been disclosed herein, other aspects and embodiments will be apparent to those skilled in the art. The various aspects and embodiments disclosed herein are for purposes of illustration and are not intended to be limiting, with the true scope being indicated by the following claims, along with the full scope of equivalents to which such claims are entitled. It is also to be understood that the terminology used herein is for the purpose of describing particular embodiments only, and is not intended to be limiting.

Since many modifications, variations, and changes in detail can be made to the described example, it is intended that all matters in the preceding description and shown in the accompanying figures be interpreted as illustrative and not in a limiting sense. Further, it is intended to be understood that the following clauses further describe aspects of the present description.

The invention claimed is:

1. A system comprising:

at least one processor;

a head-mountable display that provides a wearer field-of-view when worn;

a touch interface arranged on the head-mountable display such that the touch interface is outside of the wearer field-of-view when the head-mountable display is worn;

a non-transitory computer readable medium; and

program instructions stored on the non-transitory computer readable medium and executable by the at least one processor to perform functions comprising:

providing, on the touch interface, a user-interface comprising a set of input areas, wherein each of the input areas is associated with a character from a set of characters;

receiving, on the touch interface, first touch input data indicating a selection of a first input area from the set of input areas and a direction relative to the first input area;

determining a first subset of input areas from the set of input areas, wherein the first subset includes a range of one or more adjacent input areas extending from the

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selected first input area in the indicated direction relative to the selected first input area;

receiving, on the touch interface, second touch input data indicating a sequence of one or more successive selections of respective second input areas from the set of input areas and respective directions relative to each selected second input area, wherein each selected second input area is located to a first side of a previously selected second input area;

determining one or more second subsets of input areas from the set of input areas, wherein each second subset includes a range extending from the selected second input area in the indicated direction relative to the second input area, wherein the range is exclusive of input areas that are located to a second side of previously selected second input area, and wherein the second side is opposite the first side;

determining a word that includes respective characters corresponding to input areas within the first subset of input areas and the one or more second subsets of input areas; and

causing a visual depiction of the determined word to be provided on a head-mountable graphical display.

2. The system of claim 1,

wherein receiving, on the touch interface, second touch input data indicating a sequence of one or more successive selections of respective second input areas comprises, for at least one of the one or more successive selections of second input areas, receiving data indicating a lift input upwards from a given second input area, and wherein the respective range consists of the given second input area.

3. The system of claim 1,

wherein the set of input areas extends linearly between two terminating input areas, and wherein receiving, on the touch interface, second touch input data indicating a sequence of one or more successive selections of respective second input areas comprises, for at least one of the one or more successive selections of second input areas, receiving data indicating a flick input towards a given terminating input area of the set of input areas, wherein the respective range consists of one or more second input areas between the selected second input area and the terminating input area.

4. The system of claim 1,

wherein receiving, on the touch interface, second touch input data indicating a sequence of one or more successive selections of respective second input areas comprises, for at least one of the one or more successive selections of second input areas, receiving data indicating a drag input across one or more second input areas adjacent to the selected second input area, wherein the respective range consists of the one or more second input areas.

5. The system of claim 1,

wherein receiving, on the touch interface, second touch input data indicating a sequence of one or more successive selections of respective second input areas comprises, for at least one of the one or more successive selections of second input areas, receiving data indicating a dwell input towards from a given second input area, and wherein the respective range consists of the given second input area.

6. The method of claim 1,

wherein receiving, on the touch interface, second touch input data indicating a sequence of one or more successive selections of respective second input areas com-

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prises, for at least one of the one or more successive selections of second input areas, receiving data indicating a drag input towards a particular input area and a lift input upwards from a given second input area, and wherein the respective range consists of the given second input area.

7. The system of claim 1,

wherein determining the word comprises determining a sequence of characters beginning with a first character corresponding to an input area from the first subset of input areas and followed by one or more second characters corresponding to a respective input area from each of the one or more second subsets of input areas.

8. The system of claim 1,

wherein determining the word comprises determining a sequence of characters, and wherein determining the sequence of characters comprises:

determining a first character of the word, wherein determining the first character comprises selecting, from the first subset of input areas, a first input area that corresponds to the first character; and

determining one or more second characters of the word, wherein determining the one or more second characters comprises selecting, from each of the one or more second subsets of input areas, a respective second input area that corresponds to a second character.

9. The system of claim 1,

wherein selecting, from each of the one or more second subsets of input areas, a respective second input area that corresponds to a second character comprises determining that the character corresponding to the respective second input area has the highest prevalence of use among the characters corresponding to the input areas of the second subset of input areas.

10. The system of claim 1,

wherein determining the word comprises:

assigning, to respective second input areas of the one or more second subsets, a respective probability ranking that is proportional to the distance from the selected second input area to each second input area of the range.

11. The system of claim 1,

wherein receiving, on the touch interface, second touch input data indicating a sequence of one or more successive selections of respective second input areas comprises receiving data indicating a drag input across between the second input area and a third input area, and wherein the second subset consists of the one or more input areas, and wherein determining the word comprises assigning, to respective second input areas of the one or more second subsets, a respective probability ranking that is proportional to the distance from the third input area to each second input area of the range.

12. The system of claim 1,

wherein the set of input areas comprises input areas that are aligned linearly in a one-dimensional arrangement.

13. The system of claim 1,

causing a visual depiction of at least one of the first subset or the one or more second subsets to be provided on a head-mountable graphical display.

14. The system of claim 1, further comprising

a frame supporting the head-mountable display, the frame comprising a first support and a second support that are perpendicular to the head-mountable display, wherein the touch interface is mounted to one of the first support or the second support.

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15. A method comprising:
 providing, on a touch interface arranged on a head-mountable display such that the touch interface is outside of a wearer field-of-view when the head-mountable display is worn, a user-interface comprising a set of input areas, wherein each of the input areas is associated with a character from a set of characters;
 receiving, on the touch interface, first touch input data indicating a selection of a first input area from the set of input areas and a direction relative to the first input area;
 determining a first subset of input areas from the set of input areas, wherein the first subset includes a range of one or more adjacent input areas extending from the selected first input area in the indicated direction relative to the selected first input area;
 receiving, on the touch interface, second touch input data indicating a sequence of one or more successive selections of respective second input areas from the set of input areas and respective directions relative to each selected second input area, wherein each selected second input area is located to a first side of a previously selected second input area;
 determining one or more second subsets of input areas from the set of input areas, wherein each second subset includes a range extending from the selected second input area in the indicated direction relative to the second input area, wherein the range is exclusive of input areas that are located to a second side of previously selected second input area, and wherein the second side is opposite the first side;
 determining a word that includes respective characters corresponding to input areas within the first subset of input areas and the one or more second subsets of input areas; and
 causing a visual depiction of the determined word to be provided on a head-mountable graphical display.

16. The method of claim 15,
 wherein the set of input areas extends linearly between two terminating input areas, and wherein receiving, on the touch interface, second touch input data indicating a sequence of one or more successive selections of respective second input areas comprises, for at least one of the one or more successive selections of second input areas, receiving data indicating a flick input towards a given terminating input area of the of the set of input areas, wherein the respective range consists of one or more second input areas between the selected second input area and the terminating input area.

17. The method of claim 15,
 wherein receiving, on the touch interface, second touch input data indicating a sequence of one or more successive selections of respective second input areas comprises, for at least one of the one or more successive selections of second input areas, receiving data indicating a drag input across one or more second input areas adjacent to the selected second input area, wherein the respective range consists of the one or more second input areas.

18. The method of claim 15,
 wherein receiving, on the touch interface, second touch input data indicating a sequence of one or more succes-

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sive selections of respective second input areas comprises, for at least one of the one or more successive selections of second input areas, receiving data indicating a lift input upwards from a given second input area, and wherein the respective range consists of the given second input area.

19. A non-transitory computer-readable medium having stored thereon instructions executable by a computing device to cause the computing device to perform functions comprising:
 providing, on a touch interface arranged on a head-mountable display such that the touch interface is outside of a wearer field-of-view when the head-mountable display is worn, a user-interface comprising a set of input areas, wherein each of the input areas is associated with a character from a set of characters;
 receiving, on the touch interface, first touch input data indicating a selection of a first input area from the set of input areas and a direction relative to the first input area;
 determining a first subset of input areas from the set of input areas, wherein the first subset includes a range of one or more adjacent input areas extending from the selected first input area in the indicated direction relative to the selected first input area;
 receiving, on the touch interface, second touch input data indicating a sequence of one or more successive selections of respective second input areas from the set of input areas and respective directions relative to each selected second input area, wherein each selected second input area is located to a first side of a previously selected second input area;
 determining one or more second subsets of input areas from the set of input areas, wherein each second subset includes a range extending from the selected second input area in the indicated direction relative to the second input area, wherein the range is exclusive of input areas that are located to a second side of previously selected second input area, and wherein the second side is opposite the first side;
 determining a word that includes respective characters corresponding to input areas within the first subset of input areas and the one or more second subsets of input areas; and
 causing a visual depiction of the determined word to be provided on a head-mountable graphical display.

20. The non-transitory computer readable medium of claim 19,
 wherein the set of input areas extends linearly between two terminating input areas, and wherein receiving, on the touch interface, second touch input data indicating a sequence of one or more successive selections of respective second input areas comprises, for at least one of the one or more successive selections of second input areas, receiving data indicating a flick input towards a given terminating input area of the of the set of input areas, wherein the respective range consists of one or more second input areas between the selected second input area and the terminating input area.

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